# ERNEST ORLANDO LAWRENCE
# BERKELEY NATIONAL LABORATORY

MS 90-4000
Berkeley Lab
1 Cyclotron Rd
Berkeley CA 94720

tel: +1 (510) 486 7284
fax: +1 (510) 486 6996
email: jheto@lbl.gov
http://eetd.lbl.gov/


February 7, 2003

To: Don Kondoleon, CEC PIER Project Manager
Mark Rawson, CEC PIER Project Manager – DER
Ron Hofmann, CEC PIER Advisors – Demand Response
Linda Kelly, CEC PIER Project Manager – Transmission
Cc: Laurie ten-Hope, CEC PIER Energy Systems Integration, Team Lead
Judi Efhan, CEC Contract Administer
Tommy Bangthamai, LBNL Contract Administer
Fm: Joe Eto, LBNL Principal Investigator, CERTS Program Office Manager
Re: **CERTS/EPRI PIER project on Electric System Reliability – 10th Quarterly Report – Oct. – Dec., 2002**

Attached is a task-by-task summary of CERTS/EPRI activities during the 10th Quarter performance period for the project, October through December 2002.

Highlights for this performance period include:

A scenario analysis to identify public interest transmission R&D priorities for different possible future states of the California electricity system was initiated as the final task under the Grid of the Future project (task 2.2).

SCE agreed to provide a tailored set of real-time phasor data to CAISO to augment real-time phasor data already being provided by BPA. Discussions to also provide PG&E phasor data to CAISO in 2003 are in progress.

PowerSimulator Version 3.3.3 been used to demonstrate new approaches to market based emergency control and restoration with the Power and Light System.

Contract augmentation to extend activities initiated under task 2.3, real-time system monitoring and control was approved at the Oct. 9 CEC Business Meeting. Reporting these and the previously approved new tasks will begin with the next quarterly report as Tasks 2.7 (DER Integration), 2.8 (Demand Response), and 2.9 (Real Tim Grid Reliability Management).

Initial scoping discussions for new project, under Task 2.8, to develop demand response research agenda for CAISO were held in Folsom on Nov. 13.

## 10th Quarterly Report for CERTS/EPRI PIER project on Electric System Reliability Report – Oct. - Dec., 2002

| Task | Task Name | PIER 1st Year Budget | Deliverables | Planned Start Date | Planned End Date | Actual End Date | Report on Current Status |
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| | **Project Start-Up Tasks** | 1,000 | | | | | |
| 1.1 | Attend Kick-Off Meeting | | Kick-off meeting | 6/00 | 7/00 | 7/13/00 | Completed |
| 1.2 | Document Match Funds | | Lists/commitment letters | 6/00 | 6/00 | 6/01/00 | Completed |
| | **Technical Tasks** | | | | | | |
| 2.1 | ***Project Advisory Committee for Critical Project Reviews*** | 4,000 | | 6/00 | 5/01 | | |
| | | | Draft list of PAC members | | 6/00 | 6/01/00 | Completed |
| | | | Additional names of PAC members, if requested | | If requested | | A separate PAC will be formed for the second year of DER Integration R&D activities (see Task 2.4.5) |
| | | | Final list of PAC members | | 6/00 | 6/30/00 | Completed – current members:<br>D. Kondoleon, L. ten Hope, M. Jaske,<br>D. Hawkins (CAISO) |
| | | | Advance notice of first PAC meeting | | 6/00 | | Re-scoped by CEC project manager to bi-lateral discussions for specific project areas – Completed |
| | | | PAC meeting summary | | 7/00 | | N/A per re-scoping |
| | | | Advance notice of second PAC meeting | | 2/01 | | N/A per re-scoping |
| | | | PAC meeting summary | | 3/01 | | N/A per re-scoping; 1st year program reviews conducted for DER Integration (June 7); Load as a Resource (June 8); Real time (August 3) |
| | | | Advance notice of third PAC meeting (second critical project review – | | 4/01 | | N/A per re-scoping |

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| | | | assume held May ’01) | | | | |
| | | | PAC meeting summary | | 5/01 | | N/A per re-scoping |
| 2.2 | ***Grid of the Future*** | 150,000 | | 8/00 | 12/02 | | Project work not initiated until Aug. 10, 2000 due to administrative contract delays |
| | | | Draft White Paper | | N/A | | Re-scoped per direction from L. ten Hope and D. Kondoleon – new task is support to PIER Strategic R&D planning |
| | | | Obtain input from PAC | | | | N/A per rescoping |
| | | | Final White Paper | | | | N/A per rescoping |
| | | | Support PIER Strategic R&D planning | | 12/02 | | Planning workshop held Mar. 2001<br><br>Participated in planning sessions for Wattenburg switch (2001); Optimal Technologies (2001); AEC PAC (on-going)<br><br>Conducted interviews with senior CAISO staff (Detmers, Perez, Sheffrin) on R&D needs (2001)<br><br>Remaining funds carried-forward into second year to continue to support PIER planning on an as-requested basis<br><br>Will participate in New Technologies TAC (2003) |
| | | | Scenario Analysis for PIER Transmission R&D planning | | 3/03 | | Initiated re-scoped task to conduct a scenario analysis to assess PIER transmission R&D priorities as input to CEC Transmission Program Plan<br><br>Held internal workshop with CEC R&D committee Commissioners, staff, and invited participants to review scenarios and initial findings in Sacramento on Dec. 17. |
| | ***Optimal Technologies*** | 216,000 | | 6/01 | 10/01 | | Completed. This task was added at CEC request in June 2001. Funding for this activity delayed/deferred several Tasks under 2.3. |

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| 2.3 | ***Real Time System Monitoring and Control*** | First Year 3,434,000 (1,034,000 CERTS-led 2,400,000 EPRI-led)<br><br>Second Year 2,120,000 (920,000 CERTS-led 1,200,000 EPRI-led | | 8/00 | 6/02 | | Project work not initiated until Aug. 10, 2000 due to administrative contract delays |
| 2.3.1 | *Frequency Regulation (formerly, Ancillary Services) Monitoring, Tracking and Prediction Tool* | | | 8/00 | 11/02 | | Because of changes in CAISO Ancillary Services markets, meetings were held with CAISO management and dispatchers to redefine this tool functionality. It was agreed to use the current infrastructure (1st year task) for monitoring, tracking and predicting CAISO AGC, Frequency Response Resources (FRR), and Ancillary Regulation markets in real time ($2^{nd}$ year task). A revision to the initial requirements was required to define modifications to comply with changes to NERC-WSCC control performance Policy-1.<br><br>Additional funds have been approved in a contract augmentation to complete this re-scoped activity.<br><br>The Ancillary Services component – if authorized for continuation - will completed after the Spupliers/Control Area response to AGC and Frequency response components be deployed and tested, because CAISO Ancillary Services data are |

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| | | | | | | | not available. |
| 2.3.1.1 | Develop Detailed CAISO System Functional Requirements | | Final System Functional Specifications | | 6/01<br><br>5/02 | | Preliminary functional specification has been provided to CAISO for review.<br><br>The NERC-WSCC Frequency Response Reserves (FRR) additions to their current control performance Policy-1, required the creation a third specification draft including changes that will allow compliance with the requirements of this critical Policy-1 modification.<br><br>The revised functional specification including CAISO power system and generators performance monitoring for Automatic Generation Control AGC, Frequency Response Resources (FRR) and Regulation Markets was completed and routed to CAISO for their review and feedback.<br><br>A fourth draft was produced to incorporate an input data interface with CAISO PI system, and also introduce the proposed short-term prediction algorithms. This latest draft was delivered to CAISO for the review and feedback<br><br>A meeting has been schedule for 02/14/03 with CAISO at Folson to review their operations people feedback for the functional specification. |
| 2.3.1.2 | Create Comprehensive CAISO System Design Specification and Test Plan | | Preliminary System Design Specification<br><br>System Test Plan | | 7/01<br><br>6/02 | | Preliminary design specification has been provided to CAISO for review.<br><br>A second draft is being created to include the modifications from item 2.3.1.1.<br><br>The second draft of the design specification including the database schema and the visualization infrastructures was produced and is |

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| | | | | | | | being circulated between developers for feedback..<br><br>The algorithms for performance deviations and indices for supplier's response tracking and performance for AGC, FRR and Ancillary Services were already defined and proposed to CAISO.<br><br>The algorithms for suppliers response adequacy short term predictions for AGC, FRR and Ancillary Services were already defined and proposed to CAISO<br><br>The in-out data collection section is being redefined to account for the input data coming from CAISO PI system instead of their SCADA system.<br><br>A new version of the design specification was created to include a SQL database schema that will be used for deployment and will be feed with input data from CAISO PI system. This latest version of the design specification will be released to CAISO during the 02/14/03 meeting al Folsom. |
| 2.3.1.3 | Modify the Current DOE Software and Conduct Factory Tests | | Factory Test Results Report CPR | | 8/02 | | Database redesign to eliminate unnecessary data and include frequency regulation parameters already started.<br><br>The initial database schema design is being modified to include the changes required for to comply with the NERC-WSCC FRR requirements.<br><br>Now that application functionality has been defined, development team is working in identifying and defining the type and periodicity of the data required. |

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| | | | | | | | Coordination with CAISO staff already started to define if CAISO PI data can be used as input data for this application.<br><br>The joint CERTS-CAISO assessment indicates that most of the data required for the functionality proposed is or will be in the CAISO PI system.<br><br>The following components have been tailored, coded and tested individually:<br>a. SQL database schema<br>b. The prediction algorithms for both Suppliers and control area responses to AGC and frequency response<br>c. The monitoring, tracking and prediction visualization displays have been created and are being tested with limited data.<br>d. The master scheduler and coordinator software has been designed and preliminary coded. |
| 2.3.1.4 | Jointly with the CAISO Conduct Field Integration and Acceptance Tests | | Field Test Results Report. | | 9/02 | | N/A in this reporting period |
| | | | Users Guide Document | | 10/02 | | N/A in this reporting period |
| 2.3.2 | *VAR Monitoring, Tracking and Prediction Tool* | | | 8/00 | 10/02 | | Project has been divided in a VAR workstation for CAISO Operating Engineers (1st year task) and another workstation for Dispatchers (2nd year task).<br><br>Project has been extended to: include the California grid model, incorporate functional changes originated during the CAISO trial test, and interface with a new data input system, and a |

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| | | | | | | | new CIM network model infrastructure.<br><br>Additional funds have been approved through a contract augmentation to complete this re-scoped activity |
| 2.3.2.1 | Develop Detailed CAISO System Functional Requirements | | Final System Functional Specifications | | 6/02 | | Completed with delivery of final version.<br>More recently, a functional specification summary was prepared and delivered to CAISO IT dept.<br><br>Final version of the specification is on hold waiting for the results of the tests that will define the impact of the following CAISO requirements:<br>a) Assess and test the utilization of CAISO PI data as input instead of using their SCADA data directly as originally was specified.<br>b) Assess and test the utilization of the new CAISO CIM compliant network model instead of the original ABB model used for the SDG&E model.<br><br>Project development team is still working jointly with CAISO Staff in collecting VAR related data from CAISO PI-Data system into VAR computers, and assessing if PI-Data is suitable for the VAR functionality purposes.<br><br>A meeting with CAISO CIM-Model Team was scheduled for 9/1/02 at Folsom to review status of CAISO work on their CIM network database model, and coordinate the most practical way to transfer the CIM data model into the VAR application. Preliminary results indicate that CAISO SDG&E and SCE models will be ready for the VAR application if the decision is to go ahead with the CIM-VAR interface. |

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| | | | | | | | A meeting was held with CAISO's PI and CIM project members at Folsom. CAISO demonstrated one performance monitoring system they have developed using their PI system. Proposed data requirements were reviewed and it seems most of the data needed could be gathered from the PI system. Besides, CAISO agreed to share with CERTS some of the CIM network model capabilities for CERTS to explore the approach to incorporate CAISO CIM model in the VAR Management. |
| 2.3.2.2 | Create Comprehensive CAISO System Design Specification and Test Plan | | Preliminary System Design Specification<br><br>Software Test Plan | | 7/02 | | Final version delivered to CAISO.<br>Draft of the Factory test plan was completed.<br><br>Both the design spec and the test plan will be updated to include the expanded grid California model and functional changes.<br><br>Work already started to update the original design specification to include the new interface with CAISO PI system for input data and utilization of CAISO CIM network model. |
| 2.3.2.3 | Modify the Current DOE Software and Conduct Factory Tests | | Factory Test Results Report CPR | | 9/02 | | Design of interface with new CAISO SCADA already started.<br><br>Assessment of work to migrate to the full California grid model was completed. Meetings will be held with CAISO dispatchers to identify their experiences and feedback during the two month trial.<br><br>Tests are being conducted, jointly with CAISO personnel, to verify the technical feasibility for using PI data as real time input and CAISO CIM |

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| | | | | | | | model as the base network model to expand the current SDG&E model to cover all California.<br><br>VAR hardware and system software were upgraded to migrate to a new CAISO operating system and interface the VAR project computers with CAISO PI system<br><br>CERTS was given access to CAISO PI system and preliminary data has been collected to confirm feasibility of its utilization for this project.<br><br>CAISO personnel participated in two CAISO training seminars to become familiar with the capabilities and tools existing in the CAISO PI system.<br><br>The changes to the user interface for the visualization displays have been implemented and are being tested.<br><br>CAISO has requested CERTS research developers to sign a data confidentiality agreement before they release data required for the test of VAR application. The agreement is currently being drafted by CAISO legal department.<br><br>The local visualization (one-lines) software has been tailored and upgraded to include the capabilities to optionally display voltage magnitudes and angle together with lines flows.<br><br>The software for the master scheduler has been designed and is being coded. |
| 2.3.2.4 | Jointly with the CAISO Conduct | | Field Test Results Report. | | 9/02 | | Integration of VAR servers and clients into CAISO network (Alhambra facility) has been |

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| | Field Integration and Acceptance Tests | | | | | | completed.<br><br>An extended test plan and a new acceptance test will take place to test the new California model, functionality and data interface. |
| | | | Users Guide Document | | 10/02 | | The User guide was completed and extended to include WSCC voltage guides.<br><br>A new version will be produced to include the recommend step-by-step scenarios samples and to add the new functionality.<br><br>Work already started to update the original user guide with the extensions being implemented in this project. |
| 2.3.3 | *Post-Disturbance Assessment and Monitoring Workstation* | | | 8/00 | 12/02 | | Project has been divided in a Phasor client for CAISO Operating Engineers (1st year) and another client for CAISO Dispatchers (2nd year).<br><br>The engineer workstation has been delivered in 2001. The dispatcher workstation is work in progress<br><br>A second user training workshop for CAISO Operating Engineers phasor workstation was conducted at Folsom.<br><br>CAISO requested to further investigate the feasibility and possibility of using the WECC wide-area network as the data vehicle to transfer phasor data between CAISO, SCE and PG&E for the phasor applications originally proposed.<br><br>Additional funds have been approved in a contract augmentation to complete this re-scoped activity |

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| 2.3.3.1 | Develop Detailed CAISO System Functional Requirements | | Final System Functional Specifications | | 11/00 | 3/02 | Final version delivered to CAISO.<br><br>More recently, an updated functional specification summary was prepared and delivered to CAISO IT and Communication Groups.<br><br>Work already started to up-to-date the original functional specification to reflect the changes originated during the development and deployment of the two proposed phasor workstations.<br><br>The update of the original functional specification has been completed and delivered to CAISO for the review and feedback. It includes the changes proposed for the system being developed |
| 2.3.3.2 | Create Comprehensive CAISO System Design Specification | | Preliminary Hardware, Software, Data Communications and Application Algorithms Design Specification<br><br>Software Test Plan | | 1/01 | 3/02 | Final version delivered to CAISO.<br><br>Phasor data communication requirements were researched and report delivered to CAISO. Utilization of the WSCC data network is being researched.<br><br>More recently, an updated design specification summary was prepared and delivered to CAISO IT and Communication Groups.<br><br>Work already started to up-to-date the original design specification to reflect the changes originated during the development and deployment of the two proposed phasor workstations.<br><br>The update of the original design specification has been completed and delivered to CAISO for the review and feedback. It includes the changes |

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| | | | | | | | proposed for the system being developed |
| 2.3.3.3 | Modify the DOE Post Disturbance Workstation and its Application Algorithms, Develop Corresponding Software to Integrate with the CAISO Supplied Hardware, Data Communications, and Conduct Factory Tests | | Factory Test Results Report | | 8/01 | 9/02 | Phasor applications from BPA, SCE and PNNL have been integrated in CAISO operating engineer's workstations for Folsom and Alhambra.<br><br>Integrated applications were tested and demonstrated to CAISO operating engineers. CAISO is integrating the OE workstation into their LAN systems.<br><br>The Operating Engineers phasor workstation has been delivered to CAISO Operating Engineers at Folsom.<br><br>Delivery and installation at Folson of the Phasor Data Concentrator (PDC) is being schedule for the first week of September, 2002.<br><br>Three alternatives are being explored to connect the new CAISO PDC to the PDCs at BPA, SCE and PG&E: a) new CAISO circuits as foundation for a Phasor Data Network, b) utilization of current circuits to reduce costs and verify data transfers and functionality, and c) future utilization of the current WSCC data network infrastructure.<br><br>Jointly with CAISO Staff it was decided to start the process to use of the WECC wide-area network to transfer phasor data between the CAISO PDC and the PDCs from BPA, SCE and PG&E. CAISO representatives in the WECC, supported by the CERTS Team, obtained authorization to use the WECC data network. The project team (CAISO-CERTS) is already working on the interface of PDCs with the WECC network. |

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| | | | | | | | Preliminary meetings have taken place to define the phasor data, applications and user interface required by CAISO dispatchers to use phasor data to improve their monitoring capabilities. Alternatives are being explored to transfer the new phasor data into current security monitoring displays the CAISO Reliability Coordinators currently use.<br><br>A visualization infrastructure and preliminary design displays were completed for CAISO dispatcher monitoring using synchronized phasor measurements<br><br>CERTS, BPA and CAISO successfully completed the installation and testing of the CAISO PDC, part of this project.<br><br>Phasor data transfers were demonstrated to a number of operations personnel at CAISO including CEO Terry Winter.<br><br>CERTS is currently working with SCE andPG&E to connect their respective PDCs to the WECC Phasor Network.<br><br>A meeting was held with CAISO, SCE and CERTS project participants at SCE headquarters to define the subsets of phasor data that will be shared between the different participants. A proposed data confidentiality agreement was routed by SCE to other project participants, and it is being reviewed. There was agreement in sharing phasor data. |

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| | | | | | | | Two additional tailoring and extensions to the DOE version have been identified:<br>a. Capability to read select sets of data from the CAISO/BPA/SCE/PG&E phasor data concentrators (PDC).<br>b. Capability to read simultaneously phasor data from all the phasors residing in a PDC to be displayed on the new CAISO dispatcher displays.<br>The design of the new capabilities has been completed and the software development will start in 1st Q 2003.<br><br>The design of the three visualization displays for the CAISO dispatchers hasa been completed, and its implementation already started. |
| 2.3.3.4 | Jointly with the CAISO Conduct Field Integration and Acceptance Tests | | Field Test Results Report.<br><br>Users Guide Document | | 11/02<br><br>12/01<br><br>02/02 | | The integrated user guide was completed and delivered to CAISO.<br><br>2-days of special training sessions took place for CAISO operating engineers at CAISO location<br><br>An additional 2-day training session was requested for additional CAISO users and completed on 02/02. |
| 2.3.4 | *Improved Stability Nomograms and Remedial Action Schemes Prototype Development and Testing* | | | 8/00 | | | Activities deferred to accommodate Optimal Technologies project, see Task 2.2<br><br>A re-scoped version of this task has been approved as part of the contract augmentation adding a new task 2.9 |
| 2.3.4.1 | Develop Detailed Functional Operational Requirements | | Final Functional Specifications | | | | Reporting on this activity will continue as part of reporting on Task 2.9 |
| 2.3.4.2 | Create | | Preliminary System | | | | Reporting on this activity will continue as part of |

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| | Comprehensive Prototype Software Design | | Design Specification<br><br>Software Test Plan | | | | reporting on Task 2.9 |
| 2.3.5 | *Improved Phasor Measurement Systems Operational and Support Procedures* | | | 8/00 | 12/02 | | |
| | | | Final Operational and Support Procedures Document | | 12/01 | | Version-1 of two operational support procedures have been completed (1st Year):<br>a) The phasor database assessment document and<br>b) The compilation and description of operational procedures and processes for using phasor technologies.<br><br>Work is in progress for final recommendations for both phasor database and operational procedures<br><br>The original support procedures material produced during the first phase of the project are being organized in four-volumes to improve their effectiveness and to incorporate the most recent material and experiences gain during the installation of the CAISO PDC and the WECC phasor wide-area network. |
| | | | Final Second Generation Requirements Report CPR | | 6/02 | | N/A in this reporting period |
| 2.3.6 | *Advanced Real-Time Control System Simulation and Prototype Demonstration and Testing* | | | 8/00 | | | Activities deferred to accommodate Optimal Technologies project, per CEC request<br><br>Future work in this area will be pursued as part of DOE-sponsored work by CERTS. |
| 2.3.6.1 | Detailed Functional | | Technical report | | | | Due to reprogramming and changing CAISO |

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| | and Control Requirements | | | | | | priorities, only a scope of limited activities have been pursued on this task; IEEE papers on slow voltage control concepts have been prepared. |

## EPRI-led Tasks

| Task | Task Name | PIER 1st Year Budget | Deliverables | Planned Start Date | Planned End Date | Actual End Date | Report on Current Status/Notes |
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| 2.3.7 | *Build and Maintain Station Diagrams* | $423,000 | | 8/00 | 12/00 | | Re-scoped in meetings with CAISO on 6/30/2000. Tasks completed by 12/00. |
| 2.3.7.1 | Convert Network Model | $360,000 | CIM based on CAISO ABB EMS network model.<br><br>Report describing the software and process used to convert the CAISO ABB EMS network model to the CIM. | 9/22/00 | 10/00 | 11/27/00 | The CAISO ABB EMS network model has been imported into the CIM.<br><br>The report describing the software and process used to convert the CAISO ABB EMS network model to the CIM has been submitted. |
| 2.3.7.2 | Build CAISO Station Diagrams | $63,000 | CIM with CAISO Network Model<br><br>CAISO Station One Line Diagrams in XML format.<br><br>Display generation programs to allow modification of the station diagrams, installed at CAISO for the duration of the project.<br><br>Training of CAISO staff on the use of the programs. | 9/22/00 | 10/00 | 11/27/00 | Station One Line diagrams for all the stations in the CAISO network model have been built.<br><br>The capability of the program to highlight errors in the topology model was demonstrated.<br><br>A training session for CAISO staff was conducted on November 27th, 2000.<br><br>Project status reports were given at CAISO on November 27th 2000 and December 1st, 2000.<br><br>The User and Training Manual were delivered on November 27th 2000. |

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| | | | The Station One Line diagrams will be provided as XML files to the EMS vendors specified by CAISO.<br><br>User and training manuals | | | | |
| 2.3.7.3 | Update Station Diagrams | | | | 12/00 | | Displays have been laid out for around 180 stations including the majority of the CAISO 230 KV and 500 KV stations. This includes very large stations such as TESLA, MIDWAY and MARTIN. |
| 2.3.8 | *Interface OSI PI Historian to CIM* | $139,000 | | 10/00 | 12/02 | | Re-scoped in meetings with CAISO on 6/30/2000. Completion date delayed until December 2002. |
| 2.3.8.1 | Development of Interface Program | | A program to interface the OSI's Pi Historian standard API with the Oracle CIM database as developed by Siemens | 11/27/00 | 11/00 | | The Functional Design Specification has been submitted. Comments have been received from OSI Software. |
| 2.3.8.2 | Delivery and Testing of Interface Program | | An updated CIM model with data from a link to the PI Historian | 6/01 | 4/03 | | Due to ongoing testing with OTS completion of CIM interface with PI data delayed until April 2003. |
| 2.3.9 | *Training and Installation of Load Forecaster* | $308,000 | | 10/00 | 2/01 | 12/00 | Re-scoped in meetings with CAISO on 6/30/2000. Training and Installation completed in 2000. Support ongoing and extended. |
| 2.3.9.1 | Training of ANNSTLF Regions 1-3 | | One trained current version of ANNSTLF using its specific historical load data for each of the three regions | 9/22/00 | 12/00 | 12/8/00 | Using historical load and weather data provided by CAISO for three California regions, the ANNSTLF was trained. It was decided to do all three regions at once rather than just one. |

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| 2.3.9.2 | Installing of ANNSTLF Regions 1-3 | | Data based on training of ANNSTLF using past three years weather (temperature) and historical hourly load regional data | 9/22/00 | 1/01 | 12/8/00 | Installation completed on 12/8/2000, see section 2.3.9.1. |
| 2.3.9.3 | On-site Training | | One User's manual and training material for each region | 12/7/00 | 2/01 | 12/8/00 | Testing on-site completed on 12/8/2000, see section 2.3.9.1. |
| | | | Telephone and/or e-mail support for installation and daily running of the load forecaster for a period of one year from the delivery date of the initial region. | 12/11/00 | 2/02 | | Have held various telephone conversations to date. Have discussed what assistance is available and discussed that a CIM design has been done for ANNSTLF based on other user requests. This same design is applicable to CAISO in order to provide an integrated application . Support service continues to be available. ANNSTLF is being run daily at CAISO and results compared to other load forecasting programs. Cost increased to maintain and support ANNSTLF until 2/02. Excellent results have been obtained. Consideration is being given to expand the number of regions from 3 to 8 regions to provide greater accuracy. |
| 2.3.9.4 | Additional Training | | Additional training and support | 1/02 | 12/02 | | Additional support continues throughout 2002. A major training session took place in September '02. CAISO staff are now able to perform full daily updates |
| 2.3.9.5 | Add Additional Regions | | • Revised ANNSTLF with new ISO regions to be used in daily operation<br>• Revised ANNSTLF | 1/02 | 6/02 | | All regions have been retrained in July, 2002 due to delays in obtaining data from ISO. Half-Hour training also completed in 7/02 Complete study of weather-station weights optimization carried out. Optimal CA-ISO |

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| | | | for half-hour forecasts<br>• Pre-filter added to ANNSTLF to compute optimal weather station parameters. | | | | weights have now been established. Additional training and extension to CA-ISO was done in 9/02. |
| 2.3.10 | *CIM and Advanced Topology Estimator Program Development and Testing* | $327,000 | | 4/01 | 2 /03 | | Re-scoped in meetings with CAISO on 6/30/2000 and 3/7/2001. |
| 2.3.10.1 | Configure EPRI OTS as Test Bed for Topology Estimator | | EPRI OTS with simulation of the CAISO real-time measurements | 4/01 | 4/02 | | A new software version of EPRI OTS with graphical data engineering has been developed. Performance improvements are being made to handle full 8000 station WSCC model. |
| 2.3.10.2 | Test Base Topology Estimator with CAISO Model | | Report documenting performance of Base Topology Estimator | 10/01 | 6/02 | 9/02 | Interface between Topology Estimator and CIM and been prototyped. The detailed designed specification for the Advanced Topology Estimator has been completed. The Phase I Topology Estimator engine has been completed. |
| 2.3.10.3 | Test Advance Topology Estimator with CAISO model | | Report documenting performance of Advance Topology estimator | 3/02 | 3/03 | | The Phase II Topology Estimator Engine was completed by Nextant in December 2002 and delivered to Incremental Systems Corp.. This will be integrated with PACE and CIM in Q1 2003. The TE will be tested with the CAISO CIM XML model in Q2 of 2003. |
| 2.3.10.4 | Final Report | | Final Report on Advance Topology Estimator project | 5/02 | 6/03 | | N/A in this reporting period, re-scoped and delivery date changed |

| Task | Task Name | PIER 1st Year Budget | Deliverables | Planned Start Date | Planned End Date | Actual End Date | Report on Current Status/Notes |
|---|---|---|---|---|---|---|---|
| | | | User Manual for Advance Topology Estimator Project<br><br>CD with programs | | | | |
| 2.3.11 | *WSCC-wide Security Monitoring Display Development and Testing* | $136,000 | | 11/00 | 6/01 | | A project review meeting was held at CAISO, on June 5, 2001. The CAISO operations personnel indicated that they functionality being developed in this project seemed to duplicate the functionality available to them on the old and new EMS. It was, thus, decided to discontinue work on this project. Some of the projected cost has been transferred to the ANNSTLF project in 3Q01. |
| 2.3.11.1 | Develop Detailed Software Requirements | | Final Software Specifications<br><br>Software Test Plan | | 6/01 | | Draft Functional Design specifications completed |
| 2.3.11.2 | Create Comprehensive Software Design | | Preliminary Software Design Report | | | | N/A. |
| 2.3.11.3 | Construct Software and Conduct Factory Tests | | Final Software Design Report<br><br>Factory Test Results Report | | | | N/A |
| 2.3.11.4 | Conduct Field Integration and Acceptance Tests | | Field Test Results Report<br><br>Users Guide Document | | | | N/A |
| 2.3.12 | *Feasibility Study on the Implementation of Wide Area* | $3,000 | | 8/01 | 6/02 | | Re-scoped in meetings with CAISO on 6/30/2000. A proposed plan was presented to CAISO on 8/5/01. It was decided not to |

| Task | Task Name | PIER 1st Year Budget | Deliverables | Planned Start Date | Planned End Date | Actual End Date | Report on Current Status/Notes |
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| | *Measurement Systems (WAMS) with CIM* | | | | | | proceed with this task. |
| 2.3.12.1 | | | Feasibility Report Outline | 8/01 | 3/02 | | N/A |
| 2.3.12.2 | | | Draft Feasibility Report | 3/02 | 6/02 | | N/A |
| 2.3.13 | *Operator Training Simulator* | $649,000 | | 4/01 | 3/02 | | New task added to project as agreed to by CAISO, CEC and LBNL at meeting on 3/7/2001.<br><br>A new OTS software release is being prepared with CIM based Data Engineering, Event Scheduler and Save Case Manager, |
| 2.3.13.1 | Install Baseline OTS | | OTS base software delivered to CAISO | 3/01 | 7/01 | | A new OTS software release has been prepared with CIM based Data Engineering and Event Scheduler. PowerSimulator with EPRI OTS Version 2.3 was delivered and has been used to train CAISO OITs using the generic model. |
| 2.3.13.2 | Develop OTS Model for CAISO | | Model of CAISO system running on OTS | 5/01 | 6/02 | 9/02 | Version 3.3 of PowerSimulator has been delivered to CAISO. This version has a more complete version of the Data Engineering software and can run for extended time periods. |
| 2.3.13.3 | OTS documentation, training and Support | | Three day training course | 3/02 | 4/02 | | OTS and Model Building User Guide have been prepared. . These have been updated for the Version 3.3 release. |
| 2.3.13.4 | Final Report | | Demonstration CD | 8/01 | 12/02 | 12/02 | A new CD with the Version 3.3 software has been delivered for use by the CAISO operator training instructor. |
| 2.3.13.5 | OTS Scenarios and Utilization Training by DSI | | • Training on Scenario construction | 5/02 | 6/03 | | This project has been delayed because of delays in the delivery of the full OTS model. A deadline extension was requested and |

| Task | Task Name | PIER 1st Year Budget | Deliverables | Planned Start Date | Planned End Date | Actual End Date | Report on Current Status/Notes |
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| | | | • Testing of one complete scenario<br>• Documentation of scenarios | | | | obtained till the end of June 2003. |
| 2.3.14 | Intergration of EPRI transformer rating technology into PATh15 dynamic line rating software | $278,000 | | 12/01 | 4/02 | | New task added December 2001. |
| 2.3.14.1 | Review Gates 500/230 kV Autotransformer Heat Run data, thermal limitations on temperature and %loss-of-life, and reconcile transformer thermal model in CCA4 with present PG&E calculation method | | Technical report verifying physical power transformer thermal limitations. | 12/01 | 2/02 | 9/02 | 12/13/01 – Met with PG&E power transformer engineers (Paul Gill and Ron Sharp) to compare PTLOAD results to PG&E program. PG&E accepted basic methodology of PTLOAD and agreed to supply additional calculations.<br>Developed DTCR/PTLOAD input data from manufacturer's heat run reports for both top oil and bottom oil models on 3/31/02.<br>Received additional comments from Paul Gill regarding the moisture levels in the transformer model in 9/02 |
| 2.3.14.2 | Complete TML4.DLL library refinements and development | | • A new version of the DTCR thermal model library (TML4.DLL) for use in both PTLOAD6.0, DTCR3.0 and in the PATH15DLR1.1 software.<br>• A "wrapper" program to allow linking of the | 12/01 | 2/02 | 4/02 | The DTCR TML4.DLL is now complete but for final testing and evaluation by PDC. Demonstrated functionality of TML4.DLL in PTLOAD and DTCR. Coordinated TML4.DLL data exchange structure with Path15 V1.1 software RSD and SDD plans. UAI completed "wrapper" for library on 4/02. |

| Task | Task Name | PIER 1st Year Budget | Deliverables | Planned Start Date | Planned End Date | Actual End Date | Report on Current Status/Notes |
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| | | | TML4.DLL algorithm to Path15DLR1.1.<br>• A detailed application document to guide developers in its use | | | | |
| 2.3.14.3 | Relate Path15 Operating Actions to Transformer Loading | | Technical report relating path15 pre-contingency loads and operating procedures to post-contingency load on the Gates 500/230 kV power transformer. | 12/01 | 12/01 | 2/02 | Niskayuna Power Consultants, Inc. has begun review of power system in vicinity of Path15 in order to relate Gates PT loads after the critical double line outage to pre-contingency Path15 flows. Completed minor modifications to report 2/02. |
| 2.3.14.4 | Develop and Test Modified PATH15DLR software | | • Fully documented PATH15DLR1.1 software Beta-tested at PG&E.<br>• GUI-based database administration software | 12/01 | 5/02 | | BEST Systems is continuing the final testing of Path15V1.0 software (under a separate contract) and has begun the process of developing both the RSD and SDD for Version 1.1 (including power transformer). Nearly completed RSD and SDD including details of data exchange with DTCR/PTLOAD library 4/02<br>8/28/02 – BEST Systems in continuing to make modifications of software in response to field testing of software. |
| 2.3.14.5 | Deploy Path15 DLR(PT) Software & Field Test at PG&E | | Field Test Results Report verifying proper operation of the modified PATH15DLR software | 3/02 | 6/02 | | 8/28/02 – Software was deployed at PG&E in June, 2002. Some difficulties encountered with availability of PG&E personnel (Bob Daniels the engineer involved in earlier testing retired). Present technician has installed several upgrades to original software as we provided them.<br>9/30/02 –A number of implementation |

| Task | Task Name | PIER 1st Year Budget | Deliverables | Planned Start Date | Planned End Date | Actual End Date | Report on Current Status/Notes |
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| | | | | | | | problems involving the interface between the PG&Edatabase and that of PATH15 1.1. Software function is being modified. 12/31/02 – We have still not received a "clean" download of field data. The most recent issues involve difficulties in the transfer of CAT (tension monitor) data from RTscadaNT database to the Path15DLR database. The transfer program is operating properly and the problem is with the real time data coming into the RTscadaNT database. We obtained about a week's worth of good data for December. We'll continue working with PG&E operations personnel and BEST Systems to resolve the problems. |
| 2.3.14.6 | Prepare quarterly and Final Reports | | Monthly reports, a final report, and both source code and executable programs | ½ | 9/02 | | |
| 2.3.15 | Forward Markets Administration | $280,000 | The design and development of a Forward Market Administration (FMA) and Market Participation (MP) simulation system. | 6/02 | 6/03 | | Functional specs completed in July, 2002 |
| 2.3.15.1 | Design of the Forward Market Administration (FMA ) and Market Participation (MP) Modules | | Complete FMA and MP design document applicable to CA-ISO and at least two other ISO's. | 6/02 | 9/02 | | Design documents to be completed by end of September, 2002. Work still underway for design documents |
| 2.3.15.2 | Implementation and Testing of Basic | | Report on FMA and MP modules | 6/02 | 3/03 | | 1. OPF CIM interface work started in July and continues till January 2003 |

| Task | Task Name | PIER 1st Year Budget | Deliverables | Planned Start Date | Planned End Date | Actual End Date | Report on Current Status/Notes |
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| | Modules for the FMA and MP Models | | Beta version of software modules | | | | 2. Unit Commitment DYNAMICS CIM interface to be completed in February 2003.<br>3. OPF-DYNAMICS interfaces for Central Market Unit Commitment to be completed in January, 2003<br>4. DYNAMICS use by Market Participants to be completed in March, 2003 |
| 2.3.15.3 | Integration and Testing of FMA and MP Models STEMS Using Small Test System | | STEMS FMA and MP modules running a small test system based on CA-ISO models | 9/02 | 2/03 | | Expect initial tests in January/February 2003. Example data file exchanged, still need to have data provided through CIM |
| 2.3.16 | STEMS: Real-Time Market Simulator | $255,000 | This study will investigate the details of the transition from FERC Price Mitigation (FPM) to Market Design 2002 (MD02) using the EPRI Real-Time Market Simulator. | 6/02 | 11/02 | | |
| 2.3.16.1 | Background of FPM and MD02 | | Draft report on background research and issue identification | | | | Switched to Available Capacity (ACAP) and Automatic Mitigation Procedures (AMP) of MD02 design |
| 2.3.16.2 | Presentation of Results to CA-ISO | | Presentation | | | | Interim Results for ACAP presented. Interim results for AMP presented in Dec 2002. |
| 2.3.16.3 | Design of Real-Time Market Simulator Rules and Methodology | | | | | 12/02 | Rules have been applied as needed for analysis. Testing Cournot model formulations., Added pivotal player detection. Added AMP computation and gaming strategies. |
| 2.3.16.4 | Running Real-Time Market Simulator | | Preliminary report Presentation | | | 12/02 | Runs for ACAP complete. Currently developing a simple WECC market model for |

| Task | Task Name | PIER 1st Year Budget | Deliverables | Planned Start Date | Planned End Date | Actual End Date | Report on Current Status/Notes |
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| | and evaluating results | | | | | | demonstration purposes. Initial runs of AMP complete. Final results for AMP complete. |
| 2.3.16.5 | Final Analysis | | Draft Report<br>Presentation on analysis | | | 12/02 | Presentations on ACAP and AMP complete. |
| 2.3.16.6 | Final Report | | Final Report<br>Market Simulator program | | | | Currently working on final reports on ACAP and AMP. |
| 2.3.17 | STEMS: Data Tools and User Interface | $275,000 | The CIM Database Tools will support integration of the Short Term Electricity Market Simulator (STEMS) application using the CIM real-time relational database and CA-ISO data models and measurement data from the EMS historical data base.<br>The User Interface Tools will be delivered to display results of the STEMS applications | 6/02 | 6/03 | | An updated version 3.3.3. release with more performance improvements and intructor features was delivered to Jim Fee at the combined EPRI and IEEE OTS User Group Meeting. This version included more tabular displays for AGC, Interchange Scheduling, Time Initialization, Equipment Monitoring and Control and Event Scheduling. |
| 2.3.17.1 | STEMS: Delivery of OTS with Enhanced Data Base Tools | | The task will result in a comprehensive set of easy-to-use PC based tools that can support the initial creation and the on-going maintenance of a comprehensive operational model in Common Information Model format of the CA- | 6/02 | 11/02 | | PowerSimulator Version 3.3.3 been used to demonstrate new approaches to market based emergency control and restoration with the Power and Light System. Using a combination of automated islanding, fast load control and simultaneous unit synchronization we are able to demonstrate that system restoration can be automated and the duration of customer outages can be greatly reduced. |

| Task | Task Name | PIER 1st Year Budget | Deliverables | Planned Start Date | Planned End Date | Actual End Date | Report on Current Status/Notes |
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| | | | ISO for STEMS. This task will provide the CIM extensions and Data Engineering Forms for supporting the classes defined herein. The Forward Market Administration in section 2.3.15 will use the data models created in this task. | | | | |
| 2.3.17.2 | Delivery of OTS with User Interface Enhancements | | Two new releases of the EPRI OTS will be delivered with the user interface enhancements. These releases will be packaged on a CD and will include a test model of the CASIO system. | 6/02 | 6/03 | | A new version of the PowerVisuals user interface has been completed. This version will make it easier to customize the one-line displays using XML files. Performance improvements are being made to support large system overview displays. A new feature which supports zoom on the world map will also be included in the next release. |
| 2.3.18 | Network Reliability Project | $69,000 | Investigate how do networks, such as electric, communication and water, with complex organizations and units and with many with competing goals and interests, provide highly reliable services in the absence of command and control and in the presence of rapidly changing task environments and | 6/02 | 10/02 | 12/02 | Final Report, 1007388, "California Electricity Restructuring: The Challenge to Providing Service and Grid Reliability", completed and printed. It is also available for download from www.epri.com. |

| Task | Task Name | PIER 1st Year Budget | Deliverables | Planned Start Date | Planned End Date | Actual End Date | Report on Current Status/Notes |
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| | | | technologies. | | | | |
| 2.3.18.1 | Completion of Interviews | | Final Report | | | | |

## CERTS-led Tasks on Integration of DER, and Reliability and Markets

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| 2.4 | ***Integration of Distributed Technologies*** | 500,000 (first yr) 250,000 (second yr) | | 8/00 | 8/01 | | Project work not initiated until Aug. 10, 2000 due to administrative contract delays<br><br>First year program review held on June 7, 2001.<br><br>Second year projects approved Feb. 27, 2002<br><br>In discussions for additional activities supporting lab and field demonstration of CERTS mircrogrid that would be funded through a contract augmentation.<br><br>Contract augmentation approved at CEC Business Meeting on Sep. 11. New tasks will reported under Task 2.7, starting with 11th quarterly report. |
| 2.4.1 | Proof-of-Concept for Micro-Grid Control | | Technical report on the micro-grid simulation | | 6/01 | 3/02 | Completed<br><br>Microgrid White Paper was used as basis for CEC Microgrid workshop (Task 2.4.6) |
| 2.4.2 | Standard Electronic Power Electronic Interface (continued in second yr) | | Technical report on a scoping study of state-of-the-art IPEM module concepts and their capabilities | | 12/02 | | First year report on conceptual design completed<br><br>Second year task to build prototype initiated |
| 2.4.3 | Distributed Energy Resources (DER) Customer Adoption Model (continued in second yr) | | Technical report on DER customer adoption model enhancements for microgrid. (first year)<br><br>Technical report on DER customer adoption model CHP enhancements (second year) | | 6/01 | 12/01 | First year technical report completed<br><br>Second year task to incorporate CHP completed |

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| 2.4.4 | Planning and Technical Support for California DER Test Beds | | Technical report on microturbine testing<br><br>Technical report on lab test facilities for microgrid<br><br>Technical report on capabilities of commercially available energy manager systems to support microgrid lab testing | | 9/02 | | Completed report on preliminary micro-turbine testing at UCI to demonstrate micro-grid concepts.<br><br>Completed test bed survey report.<br><br>Energy manager survey report in review. This deliverable was added as part of additional technical support for planned Microgrid lab demonstration |
| 2.4.5 | Program Advisory Comm. (new for second yr) | | Support CEC program advisory committee for DER integration activities | | 12/03 | | Initiated 3/01 |
| 2.4.6 | Microgrid Workshop (new for second yr) | | Planning support for May 3 CEC Microgrid workshop | | 5/02 | | Completed. Microgrid workshop held at CEC with CEC, Navigant, and DOE on May 3, 2002. |
| 2.4.7 | Test Grid Design (new for second year | | Conduct research and create RFP to retain lab facilities for microgrid experiments | | 3/03 | | Planning discussions held with CEC<br><br>Initial discussions begun with Capstone Microturbines.<br><br>“Due diligence” review of available engineering firms to support development of test grid design conducted.<br><br>Recommendation to proceed with sole source to Northern States Power reviewed with and endorsed by CEC project manager. Initial discussions begun with Northern Power.<br><br>Kick-off meeting held at Northern Power in VT on Dec. 13. |

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| | | | | | | | This task will be completed under the Contract Augmentation (Task 2.7) – future reporting on this subtask will be included in reporting on Task 2.7 in subsequent quarterly reports. |
| 2.5 | **Reliability and Markets** | 450,000 | | 8/00 | 6/01 | | Project work not initiated until Aug. 10, 2000 due to administrative contract delays |
| 2.5.1 | Utilization of Load as a Bulk-System Imbalance Energy and Ancillary Service Resource | | | 8/00 | | | First year program review held on June 8, 2001.<br><br>Contract augmentation for additional Demand Response activities (Task 2.8) was approved at CEC Business meeting held on Sep. 11. Future reporting on these tasks will be including in reporting on Task 2.8 in subsequent quarterly reports |
| | | | Technical report on the inherent capability of various load types to potentially provide reliability services to the power system and on communications and control requirements to provide each ancillary service | | 3/01 | 5/01 | Completed. Initial report delayed to ensure coordination with related DOE project.<br><br>Second report prepared by SCE examining existing SCE Load Management programs and concepts for a new mass-market Demand Response program is in internal review. |
| | | | Progress report on extending this general effort to a particular commercial chain | | 9/02 | | Re-scoped based on early discussions with commercial chain. New focus is water pumping – in discussions with Ca. DWR. Carrying forward funds into the second year. |
| | | | Progress report on redesign of experimental modeling capabilities | | 6/01 | 6/01 | Completed. Deliverable was Rutgers conference paper reporting on first year experimental economics findings |
| | | | Memos on technical support to CAISO load programs, including CAISO/WSCC | | 6/01 | | Task completed. Memos prepared on Jan. 22, Feb. 7, 2001. |

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| | | | communication/control requirements | | | | |
| 2.5.2 | Identifying Ancillary Service Reserve Requirements vs. Total Generation / Load | | Technical report on alternative flexible (soft-guide thresholds) control performance regulation metrics reflecting system operations within competitive electricity markets | 8/00 | 12/01 | | Re-scoped in meetings with CAISO during summer 2000. New focus is on examining system frequency metrics. Funds reprogrammed to support Task 2.3.1 |
| 2.5.3 | CAISO's Congestion Management Philosophy and Design | | Technical report on the investigation of existing and development of alternative mechanisms and methodologies for creating new zones. | 8/00 | 3/01 | | Task completed. This work is being conducted in conjunction with CAISO contract with A. Papalexopoulous. Working with CAISO on procedure to release final report. |
| 2.6 | **Statement of Work for Second Year Activities** | 20,000 | | 3/01 | 6/01 | | Additional follow-on tasks will be funded through contract augmentations approved on 9/11/02 and 10/9/02 CEC business meetings |
| | | | A statement of work and detailed budget for the second year research activities. | | 4/01 | 2/02 | Completed. Statements of work prepared for second year activities in real time system monitoring and control and DER integration.<br><br>Additional SOWs were prepared for the contract augmentations |
| | | | Presentation to the RD&D as directed by the Commission Contract Manager. | | 4/01 | 2/02 | Completed. R&D committee approved second year tasks at 2/27/02 meeting. |
| 3.0 | **Reporting Tasks** | 25,000 | | | | | |
| 3.1 | Quarterly Progress Report | | Quarterly progress reports | 6/00 | Ongoing | | This document is the quarterly report for the 10th quarter for Oct.-Dec., 2002. |
| 3.2 | Final Report | | | 4/02 | 6/02 | | In progress |
| 3.2.1 | Final Report Outline | | | | | | CEC approved format/structure for final report |
| 3.2.2 | Draft Final Report for Comment | | | | | | In progress |

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| 3.2.3 | Final Report | | | | | | N/A in this reporting period |
| 3.3 | Final Meeting | | Meeting | 6/02 | 6/02 | | N/A in this reporting period |
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